DEVELOPMENT OF AN OBJECTIVE SPACE SUIT MOBILITY PERFORMANCE METRIC USING METABOLIC COST AND FUNCTIONAL TASKS

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BACKGROUND

Existing methods for evaluating EVA suit performance and mobility have historically concentrated on isolated joint range of motion and torque. However, these techniques do little to evaluate how well a suited crewmember can actually perform during an EVA. An alternative method of characterizing suited mobility through measurement of metabolic cost to the wearer has been evaluated at Johnson Space Center over the past several years. The most recent study involved six test subjects completing multiple trials of various functional tasks in each of three different space suits; the results indicated it was often possible to discern between different suit designs on the basis of metabolic cost alone. However, other variables may have an effect on real-world suited performance; namely, completion time of the task, the gravity field in which the task is completed, etc. While previous results have analyzed completion time, metabolic cost, and metabolic cost normalized to system mass individually, it is desirable to develop a single metric comprising these (and potentially other) performance metrics. This paper outlines the background upon which this single-score metric is determined to be feasible, and initial efforts to develop such a metric. Forward work includes variable coefficient determination and verification of the metric through repeated testing.